

THE AMPHIPOD GENERA *EUONYX*, *SYNDEXAMINE* AND *PARADEXAMINE*

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Fig. 1-9.

THE specimens treated below have been selected in order to revise the genera concerned. They were taken from tow nettings and dredgings made on the patrol boat of the Department of Fisheries and Game, during March, 1938, in Spencer Gulf, South Australia; these collections were made possible by the co-operation of the Chief Inspector of Fisheries and Game (Mr. F. W. Moorhouse).

Acknowledgments are due to the Council for Scientific and Industrial Research and to the Board of Governors of the Public Library, Museum, and Art Gallery of South Australia for their assistance; to Professor E. Percival, of the Canterbury University College, New Zealand, for the loan of New Zealand type material for comparison and revision; to Professor G. E. Nicholls, of the University of Western Australia, for literature; and to Dr. R. C. Bassett, of Adelaide, for the use of his apparatus in the preparation of the drawings.

The species dealt with in this paper are only a fraction of those obtained. The remainder cannot be described until the revision of Haswell's types of Australian Gammaridea, now in progress, has been completed.

A curious feature of the material collected was the very great predominance of Gammaridea in both tow-nettings (using Marine Biological Association standard nets) and dredgings. Copepoda, Euphausiacea and Mysidae were very scarce, Hyperiidæ were absent, while fish eggs were only present in one tow-netting—and then in very small numbers. *Nebalia* and *Sagittæ* as yet undetermined were moderately plentiful. This balance was constant from near the head waters of the Gulf up to and including the open sea near Kangaroo Island.

There would appear to be some connection between the abundance of destructive forms and the relative scarcity of fish and oysters, but since this is the first time tow-nettings have been made in these waters, any conclusions are premature.

FAMILY LYSIANASSIDÆ

EUONYX Norman, 1867.

Stebbing, 1906, p. 19 (key); Chevreux, 1908, p. 1 (fig.), and 1919, p. 576; Barnard, 1916, p. 110; Chilton, 1921, p. 52 (fig.); Stephensen, 1923, p. 41; Schellenberg, 1926, p. 200; Pirlot, 1933, p. 120 (fig. and key); Sheard, 1937, p. 19.

EUONYX PIRLOTI sp. nov.

Euonyx normani (nec Stebbing) ; Chilton, 1921, p. 52 ; Pirlot, 1933, p. 120 ; Sheard, 1937, p. 19.

Chilton ascribed his specimen (♂) to *Euonyx normani* Stebbing (1888, p. 669, pl. xix), and from manuscript notes in my possession, was considerably in-

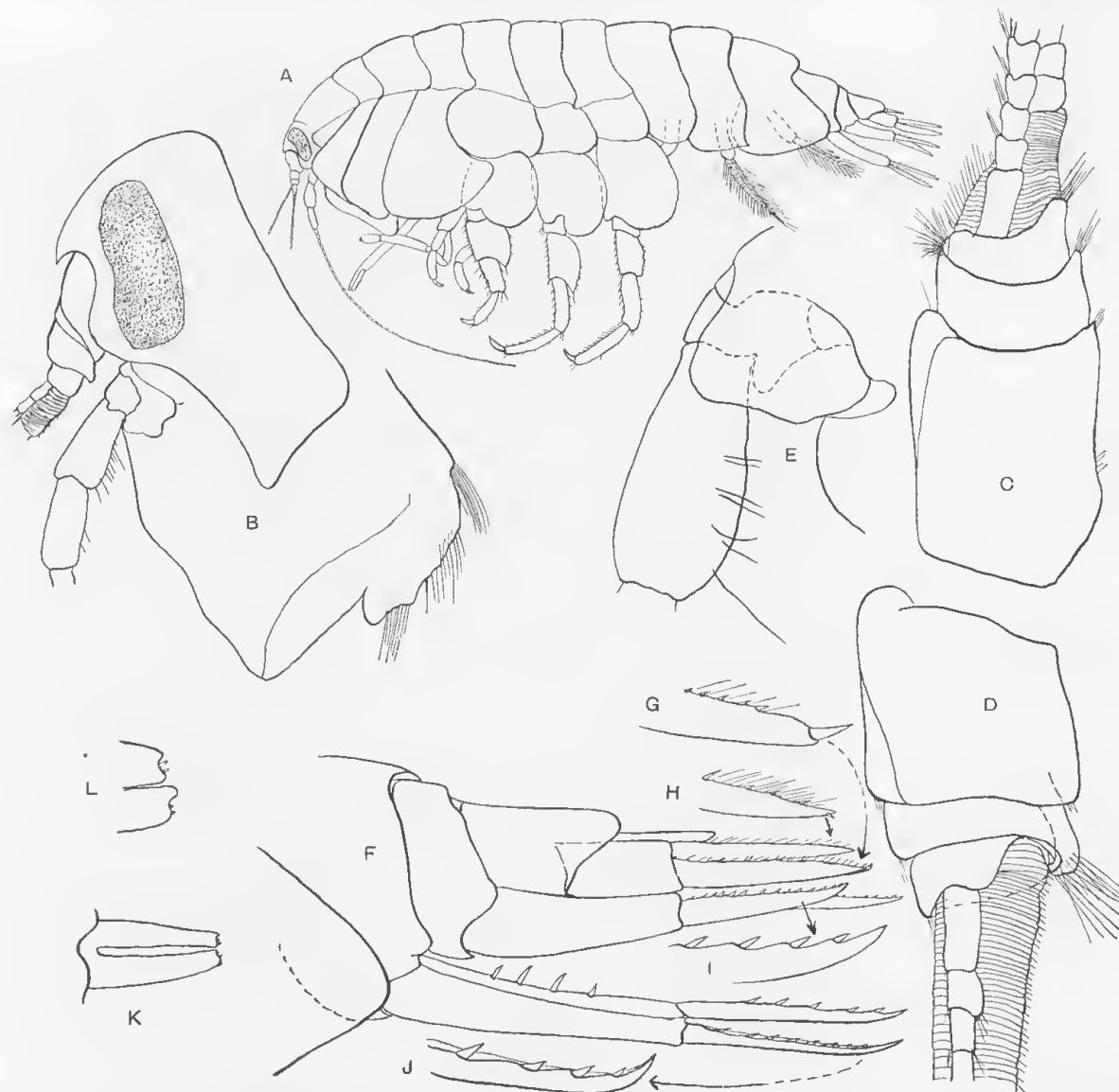


Fig. 1. *Euonyx pirloti*: A, lateral view (♀); B, detail of head and epistome; C, peduncle first antenna (♀); D, peduncle first antenna (Chilton's ♂), refigured; E, attachment of antenna (♀); F-I, details of urosome and uropoda (♀); L-K, telson (♀). (K.S. del.)

fluenced in this by the fact that Stebbing's species was a (♀) with the (♂) yet to be discovered. Pirlot (loc cit. p. 120) in his key separates the two, while Sheard (loc. cit., p. 19) states that Chilton's specimen is probably not the (♂) of Stebbing's species.

Specimens obtained by Mr. F. W. Moorhouse off Kangaroo Island led me to search carefully through the unnamed material in the Museum collection, with the result that a long series has been found (♀ ♀, ♂ ♂) which, on examination, proved to be conspecific with Chilton's specimen. The new species has been named in recognition of the credit due to Professor J. Pirlot for his original separation.

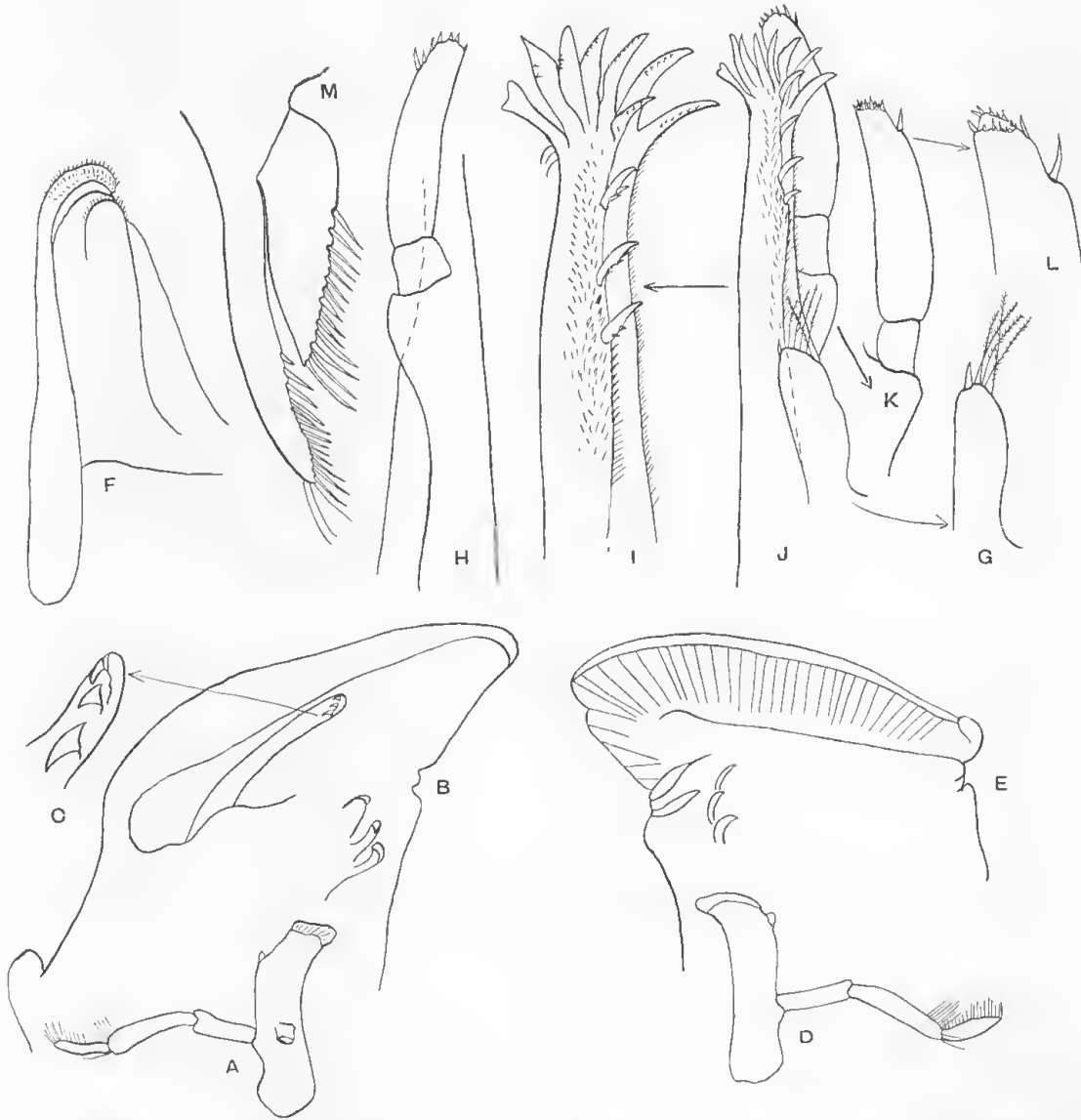


Fig. 2. *Euonyx pirloti* (♀): A-E, details of mandibles; F, half of lower lip; G-L, details of first maxilla; M, second maxilla. (K.S. del.)

In a recent letter from Professor G. E. Nicholls, he remarks: "With reference to your remarks about *Euonyx normani* as identified by Chilton, I should tell you that I too have amongst the "Discovery" material a specimen (ovigerous ♀ only), which I regard as new, and probably belonging to the same species as that referred by Chilton to *E. normani* Stebbing. If you are publishing shortly, would you let

me see the typescript, so that I may refer my species to your manuscript name if that is necessary. If, however, you are not proposing to publish immediately, I should still be glad if you would allow me to quote you as having made that same discovery from South Australian material."

Tracings of the South Australian specimen have been forwarded to Professor Nicholls. and thanks are due to him for his courtesy.

So far specimens have been obtained in dredgings close to land and in washings from reefs. The species is a moderately common element in the faunule, at a cursory glance quite like *Waldeckia*, but distinguishable therefrom by its chelate first gnathopod.

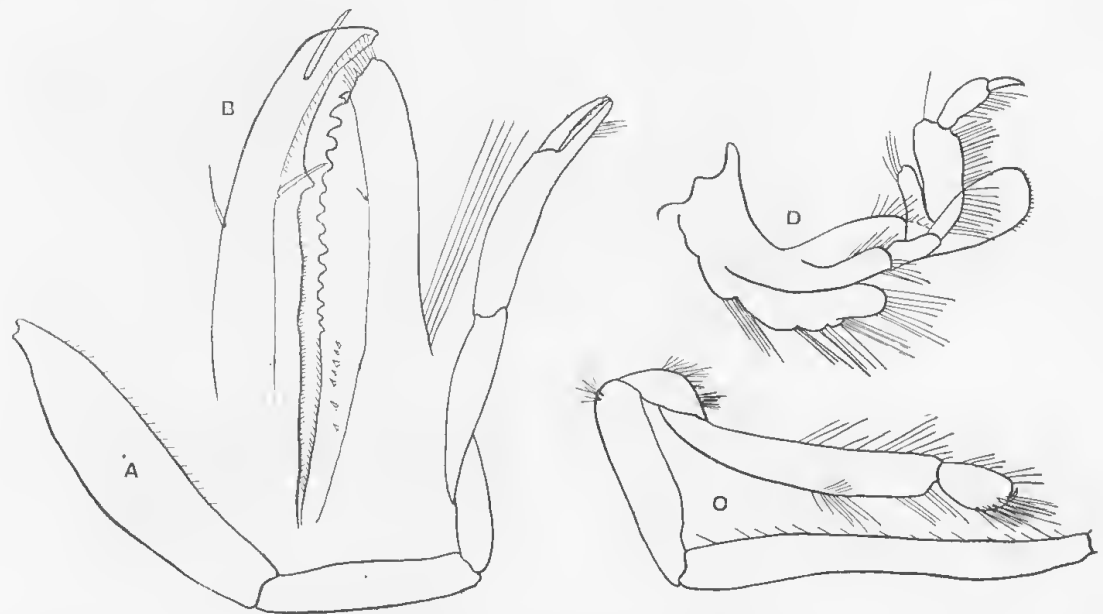


Fig. 3. *Euonyx pirloti* (♀): A, first gnathopod; B, detail of chela; C, second gnathopod; D, lateral view, maxilliped. (K.S. del.)

The specimen figured (♀), Kangaroo Island, is representative of the series, although those specimens collected in St. Vincent Gulf are slightly less robust, with gnathopods 1 and 2 slightly more slender. The specimen is fully figured so that only the main differences from *Euonyx normani* Stebbing are given here.

Mandible; palp with first segment equal to third, and three-quarters length of the second. (*E. normani*, one-third length of second.)

Maxilliped; the second segment of the palp appears to be relatively longer and more expanded.

Gnathopod 1; giving the basis (segment two) the value of one hundred, the proportions of the segments are as follows:

<i>E. pirloti</i>	100	90	39	55.2	69.7	25
Segment	2	3	4	5	6	7
<i>E. normani</i>	100	50	41.8	36.2	87.5	21

Gnathopod 2; giving the length of the basis the value of one hundred, the proportions of the segments are as follows:

Segment	2	3	4	5	6	7
<i>E. normani</i>	100	43.7	37	56	31	3.1
<i>E. pirloti</i>	100	50	23.3	68.8	20	3.3

Pleon segment 3; side plate not pointed behind.

Peraeopod 5; segment 5 is slightly longer than segment 4, not shorter as in *E. normani* Stebbing.

The rami of the uropods are approximately equal in length. (The outer ramus of uropod 2 is slightly foreshortened in fig. 1 (f).) No small teeth could be seen on the dorsal surface of the telson (c.f. Stebbing, 1888, pl. xix).

The relatively much longer gnathopod 1 of *E. pirloti*, due to a longer segment five, and its attachment nearer to the anterior end of segment four than in *E. normani*, readily distinguishes between them.

In passing, it may be noted that Chilton (loc. cit. p. 52, fig. 5a) omitted a shallow groove on the anterior dorso-lateral surface of his figure of segment one of antenna 1. This groove gives a slightly keeled effect to this segment.

Loc. Nepean Bay, Kangaroo Island (F. W. Moorhouse, May, 1938); Brighton, St. Vincent Gulf (K. Sheard and B. C. Cotton, Mar., 1937); Sellick's Beach, St. Vincent Gulf (H. M. Hale, Apr., 1936); off Semaphore, St. Vincent Gulf (H. M. Hale, Mar., 1924); Speneer Gulf (A. Zeitz, 1887); Ardrossan (Dr. J. C. Verec, Jan., 1903); Western Shoal, Speneer Gulf (K. Sheard and F. Moorhouse, Mar., 1938).

FAMILY DEXAMINIDAE

Dexaminidae; Stebbing, 1906, p. 514 (*lit.* and *syn.*), and 1910, p. 602; Chilton, 1914, p. 332; Spandl, 1924, p. 56; Schellenberg, 1928, p. 655, and 1931, p. 209; Barnard, 1932, p. 217.

The following key is adapted from Stebbing (1906, p. 514) to include recent genera:

- a. Maxillipeds, palp with 3 segments.
 - b. Lower lip, with inner lobes well developed. *Dexaminella*
 - bb. Lower lip, with inner lobes rudimentary.
 - e. Peraeopods 1-5, 4th segment shorter than 5th and 6th combined *Dexamine*
 - cc. Peraeopods 1-5, 4th segment longer than 5th and 6th combined *Tritacta*

- aa. Maxillipeds, palp with four segments.
 - d. Maxilla 1, palp with one segment.
 - e. Maxillipeds, inner plates short and bud-like .. *Dexaminoides*
 - ee. Maxillipeds, inner plates of moderate size.
 - f. Lower lip, mandibular process absent *Syndexamine*
 - ff. Lower lip, mandibular process present *Paradexamine*
 - dd. Maxilla 1 palp with two segments.
 - g. Maxilla 1, second segment of palp large, maxillipeds, inner plates well developed *Polycheria*
 - gg. Maxilla 1, second segment of palp small, maxillipeds, inner plate rudimentary *Guernea*

The genera discussed here are *Syndexamine* and *Paradexamine*.

Professor E. Percival, to whom I wrote for types, states:

“There are no types of *Paradexamine pacifica* (Thomson), merely tubes of material labelled with the country of origin. You will need, I suppose, to select suitable specimens for description therefrom. *Syndexamine carinata* Chilton is represented only by two co-types.”

Accordingly, specimens have been selected and figured as lectotypes.

In passing it is worth recording that the examination of some of Chilton's Amphipod material and its comparison with more modern work has convinced me that he tended to simplify the issue a little too much. While it is quite true that growth changes occur in the chitinous cuticle with age, that secondary sexual characters emerge and develop, and that every specimen varies in some slight particulars from every other specimen; it is also true that growth changes tend to follow a certain course within the species, that secondary sexual characters develop in a definite manner, while the intra-specific variation bears a high degree of relationship to the species itself. Consequently it is the business of the systematist to record outstanding differences and divergencies from the already known ranges of variation and not to seek to integrate the pattern until significant data, widely spaced along the curve of variation, is accumulated.

Full illustration of all differences is essential, an ideal often difficult of attainment.

SYNDEXAMINE Chilton.

Syndexamine Chilton, 1914, p. 332 (fig.).

SYNDEXAMINE CARINATA Chilton.

Chilton's generic description must be slightly emended as a large well-defined molar area is present.

Lectotype (♂). As described and figured by Chilton except in the following particulars:

A definite, large molar area is present.

An accessory plate (see fig. 4, A, B, C, D) is present.

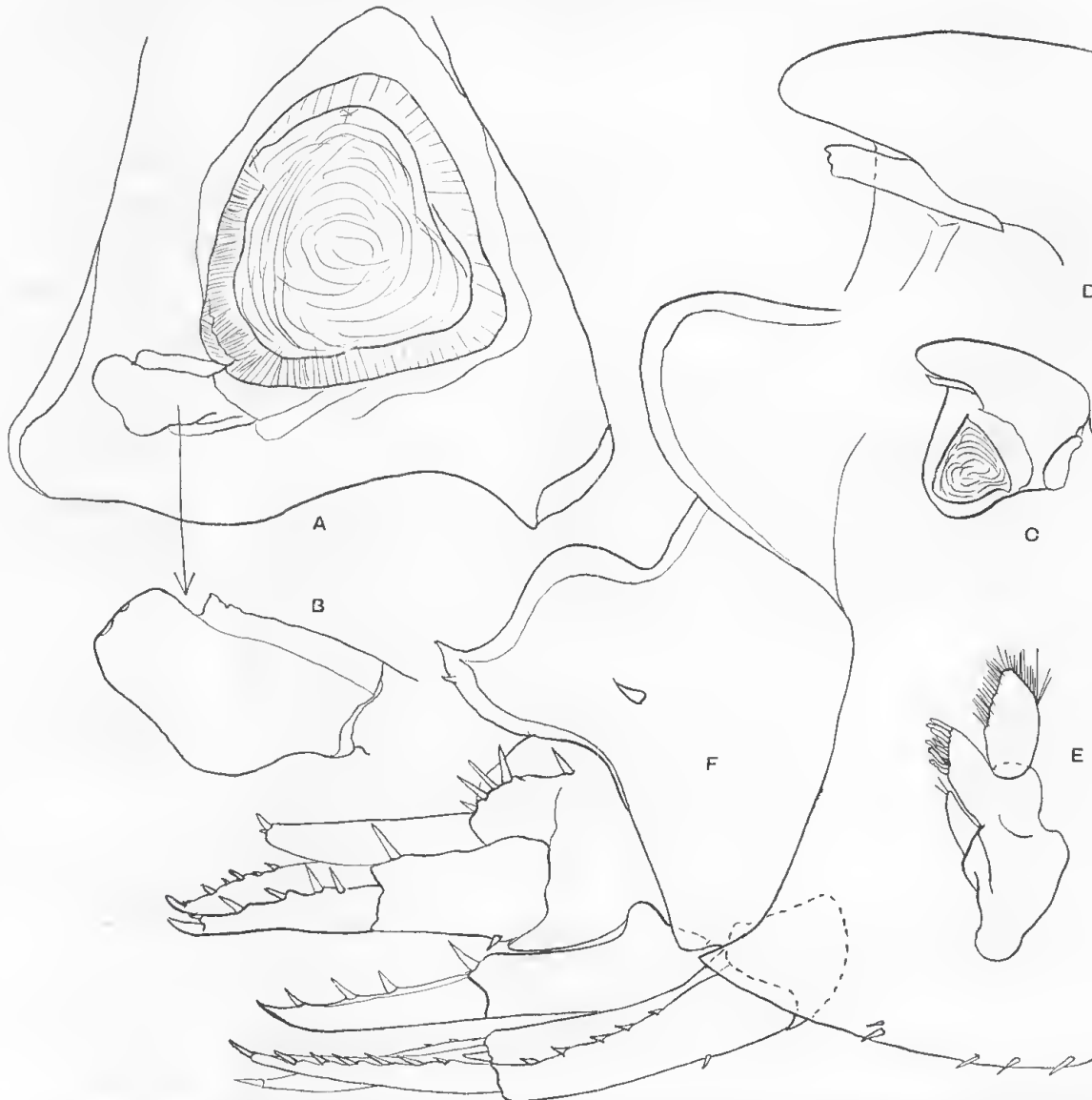


Fig. 4. *Syndexamine carinata* (lectotype): A-D, mandibles; E, first maxilla; F, urosome. (K.S. *del.*)

The palp of Maxilla 1 appears to be broader than in Chilton's figure.

The small rounded protuberance in the mandibles mentioned by Chilton (*loc. cit.* p. 334) appears to be the newly-developing mandibular cutting edge, previous to moulting.

The eye is slightly oval, and is situated between the two antennae at the base of the inter-antennal angle.

PARADEXAMINE Stebbing.

Paradexamine Stebbing, 1906, p. 518 (*lit.* and *syn.*), and 1914, p. 366; Chevreux, 1906, p. 88 and 1913, p. 181; Chilton, 1909, p. 632, 1912, p. 501 and 1925, p. 179; Stephensen, 1927, p. 347; Barnard, 1930, p. 389, and 1932, p. 217; Sheard, 1937, p. 25.

As it is difficult to find a reliable character which has been positively described by authors for each of the seven species of this genus, the following key which I have drawn up for their separation is even more suspect than most. It is accurate within its limits, but must be used in conjunction with the specific description.

- a. Apex of telson with many small teeth on each lobe, inter-antennal angle pointed.
 - b. Gnathopod 2, joint 5 subequal to joint 6 *P. pacifica*
 - bb. Gnathopod 2, joint 5 more than $1\frac{1}{2}$ times joint 6.
 - c. Lower lip, with no teeth on apex of each lobe *P. moorhousei*
 - cc. Lower lip, with one tooth on apex of each lobe *P. barnardi*
- aa. Apex of telson with several small teeth together on each lobe, then an outer spine. Inter-antennal angle convex.
 - d. Gnathopod 2, joint 6 longer than joint 5; antenna 1, first joint of peduncle longer than second; antenna 2, peduncle stout, subequal to peduncle of antenna 1 *P. flindersi*
 - dd. Gnathopod 2, joint 6 shorter than joint 5; antenna 1, first joint of peduncle shorter than second; antenna 2, peduncle long and slender, longer than peduncle of antenna 1 *P. frinsdorfi*
- aaa. Apex of telson with two teeth separated by a strong spine, antennal angle rounded (? *P. nana*).
 - e. Maxilla 11, setae on distal third of inner edge of inner plate *P. sexdentata*
 - ee. Maxilla 11, setae confined to end of inner plate *P. nana*
- aaaa. Apex of telson without teeth, antennal angle rounded; lower lip, a tooth on inner margin of outer lobes; maxilla 11, seta on inner edge of inner plate *P. fissicauda*

PARADEXAMINE PACIFICA (Thomson).

Stebbing, 1906, p. 518 (*lit.* and *syn.*); Chilton, 1909, p. 632; Stephensen, 1927, p. 347 (fig.) and 1938, p. 246; Schellenberg, 1931, p. 209; *nec* Barnard, 1930, p. 389, fig.

The specimens sent to me from the Chilton collection include some originally collected and named by Thomson, but the only locality given is New Zealand. As might be expected, there is a slight variation existing between the specimens in minor characters, but the complex is itself so clearly marked off from any other

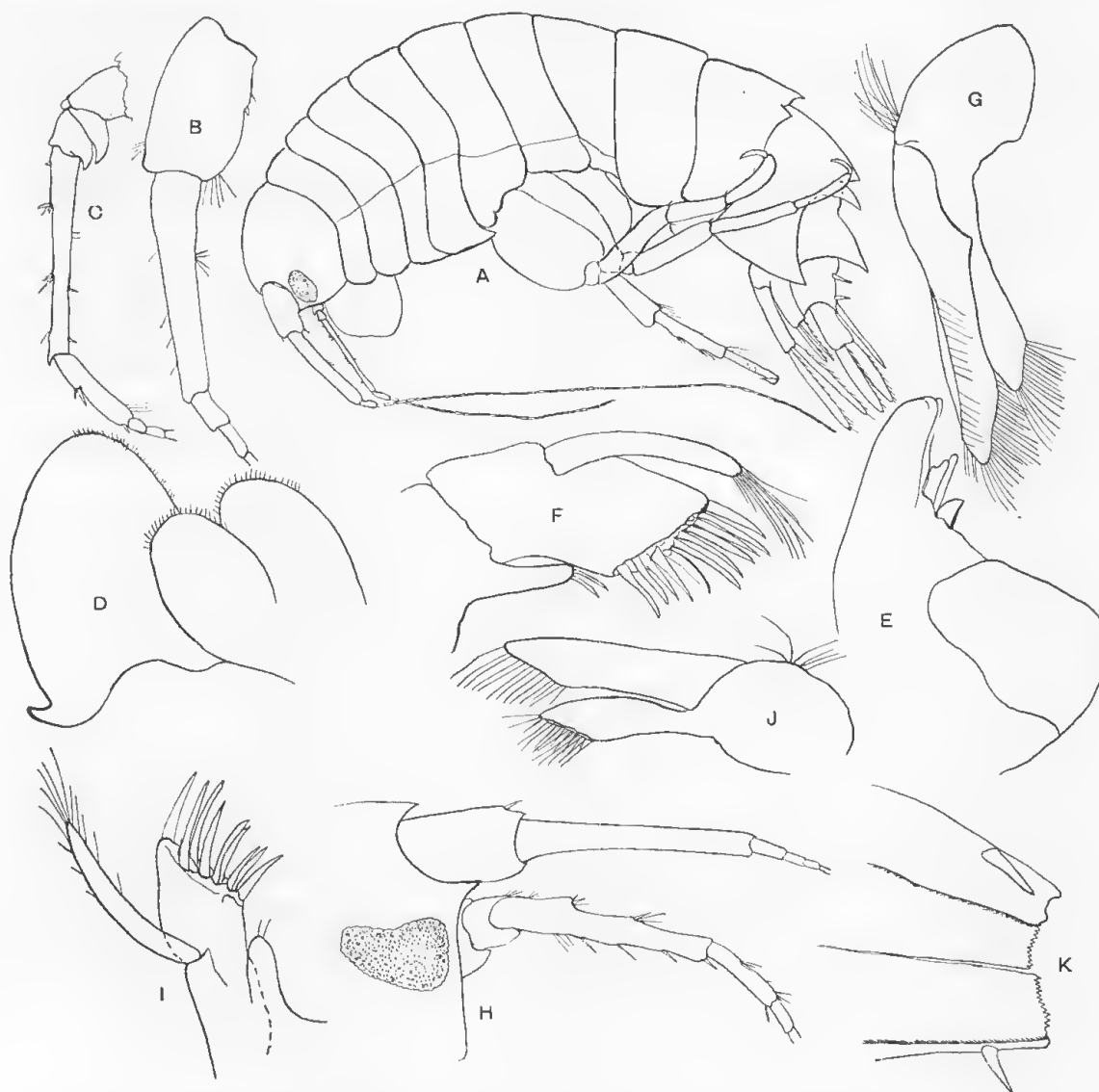


Fig. 5. *Paradexamine pacifica* (lectotype ♂, ♀): A, lateral view (♂); B, peduncle first antenna (♂); C, peduncle second antenna (♂); D, portion of lower lip (♂); E, mandible (♂); F, first maxilla (♂); G, second maxilla (♂); H, head (♀); I, first maxilla (♀); J, second maxilla (♀); K, tip of telson (♀). (K.S. *del.*).

species of the genus that there would be nothing gained by making further new species or subspecies. When material is to hand with the localities definitely marked, splitting is to some extent justified. The characters which present some degree of variation are as follows:

1. The armature of the peracopods.
2. The presence in varying numbers of setae on the margins of the palp of maxilla 1.
3. The presence in varying numbers of scattered setae on the outer edge of the outer plate of maxilla 2.
4. The finger of the palp of the maxilliped varying from slightly swollen and blunt (type) to slender. In no case is it at all large.
5. The eye colour (spirit specimens) varies from very faded to very bright red.

Among the constant characters connecting all the specimens are the following :

1. The pointed inter-antennal angle of the head.
2. The slightly swollen first joint of antenna 1.
3. The relative proportions of the joints of the gnathopods and peraeopods.
4. The slightly greater length of peraeopod 4 as compared with peraeopods 3 and 5.
5. The presence of two spines on each side of the dorsal surface of the last urosome segment.

The last part of Thomson's statement, "Peraeopoda slender, thickly setose, all having the dactylos directed posteriorly, except the last pair, which are also much the longest" (Trans. N.Z. Inst., XI, 1878, p. 238), is incorrect in one particular. On account of the way in which the peraeopoda are carried it is very easy to consider the longest to be peraeopod 5; actually it is peraeopod 4.

Two specimens (♂ and ♀) have been erected as lectotypes. Their salient points have been figured. For the rest, while I am not quite satisfied that Stephensen (loc. cit. p. 345) was dealing with the same species, I can see no difference in the appendages named below, and since Thomson's specimens are somewhat damaged by long storage, while Stephensen's figures of the peracopods and uropods are taken from comparatively fresh material, I see no necessity for duplicating his work. In the type selected the pleon side plates are slightly damaged. In other specimens they are as drawn by Stephensen (loc. cit. p. 345).

Distribution: New Zealand; East Coast of Australia (?).

PARADEXAMINE BARNARDI sp. nov.

PARADEXAMINE PACIFICA (*nec* Stebbing) Barnard, 1930, p. 389, fig.

At the request of Dr. H. K. Barnard, of the South African Museum, some specimens of this "Terra Nova" species were sent to me by Dr. Isabella Gordon, of the British Museum.

As is usually the case with such expeditions, the specimens had obviously

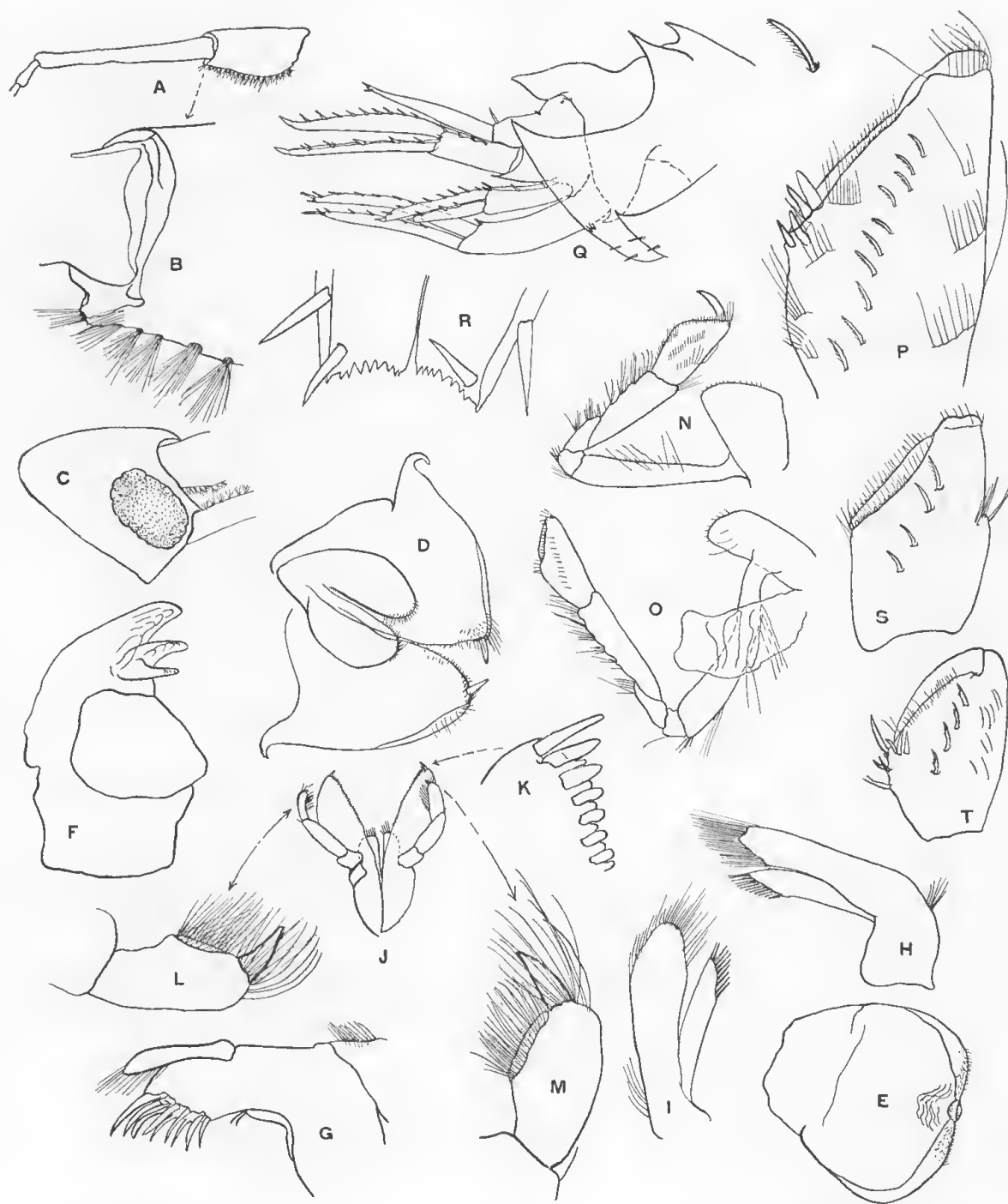


Fig. 6. A-R, *Paradoxamine barnardi* (type ♂): A, peduncle, first antenna; B, sensory setae; C, cephalon; D, lower lip; E, upper lip; F, mandible; G, first maxilla; H-I, second maxilla; J-M, details of maxilliped; N, first gnathopod; O, second gnathopod; P, hand, first gnathopod; Q, urosome; R, apex, telson; S, *Paradoxamine moorehousei*: hand, first gnathopod; T, *Paradoxamine frinsdorfi*: hand, first gnathopod. (K.S. del.).

been for a considerable time in formalin before their transfer to spirit. This has had the usual effect of making the chitin very brittle, resulting in reticulations of the surface and false joints, very difficult to distinguish from true ones in the antennae, unless the underlying muscle fibres are made visible by appropriate staining.

Direct comparison with type specimens of *P. pacifica* (Thomson) and with other *Paradexamine* species shows that the "Terra Nova" specimens are distinct from, but fairly closely allied to, *P. pacifica*, and I regret that the time of going to press of this paper will not permit me to follow the course of returning them to their original author for fuller description.

The general facies, with the exceptions noted by Barnard, show a close resemblance to the *P. pacifica* group. The lower lip with its toothed apex resembles *P. fissicauda*, while the large outer plate of the maxilliped is somewhat like *P. flindersi*.

However, unless the species concept is enlarged beyond the point when it will be of use in taxonomy, these are all distinct species.

The species is as described by Barnard (*loc cit.*, p. 389) with the exception of the second joint of the peduncle of antenna 2 (fig. 9, A) and the addition of the following details.

Upper lip; slightly lobed on its upper margin.

Lower lip; with a tooth on the inner margin of the apex of each outer lobe.

Maxilla; with two hairs on the inner plate.

Maxilliped; outer plate slightly longer than palp. Finger of palp very small.

Gnathopod 1; long and slender, joint five longer than joint six.

Gnathopod 2; long and slender, joint five about one-and-a-half times joint six.

The row of transverse fringed spines on the hands of the gnathopods vary much as in *P. pacifica*; in *P. moorhousei* and *P. frinsdorfi* the number is less, but there is a slight variation.

Pleopods; long and slender.

There appears to be only one long spine on each side of the dorsal surface of the last urosome segment near the telson.

Branchiae; pleated.

The fascicules of setae on the peduncle of the antennae are distinctive.

Loc. Off Three Kings Island, north of New Zealand.

PARADEXAMINE MOORHOUSEI sp. nov.

Very like *Paradexamine pacifica* (Thomson) but smaller and much more lightly spined.

The resemblances lie mainly in the pointed inter-antennal angle, the lower lip, the proportions of the pereopods (pereopod 5 excepted) the type of carination, the dentation of the apex of the telson, and in the general facies.

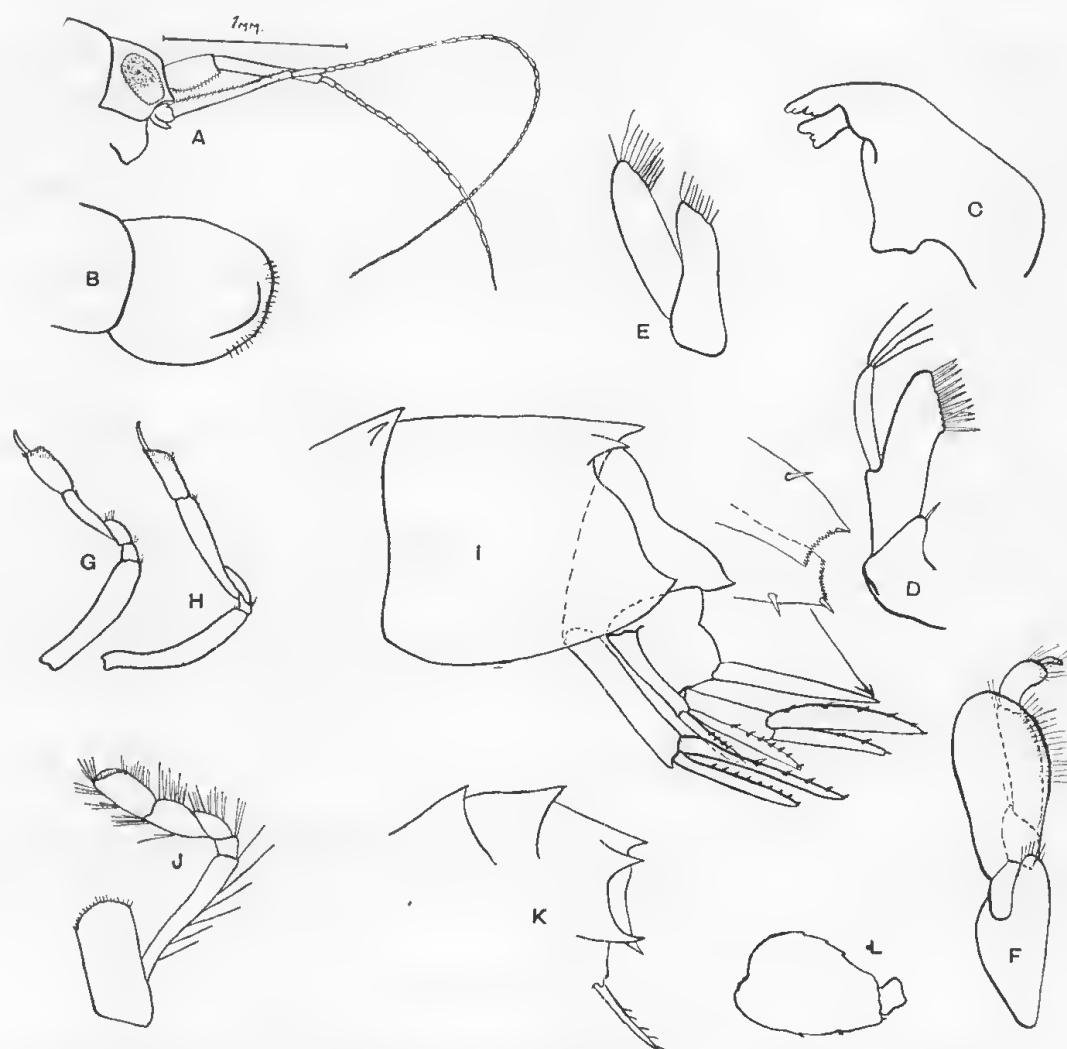


Fig. 7. A-L, *Paradexamine moorhousei* (type ♀): A, head and antennae; B, upper lip; C, mandible; D, first maxilla; E, second maxilla; F, half of maxilliped; G, first gnathopod; H, second gnathopod; I, urosome; L, basis pereopod 5. (K.S. del.). J-K, *Paradexamine sexdentata* (after Schellenberg): J, first gnathopod; K, dorsal outline of pleon.

The main differences are:

Antenna 1; no tooth on the lower margin of the first joint of the peduncle, but instead rows of single setae.

Antenna 2; instead of spines the fourth joint of the peduncle bears a fringe of single setae.

Eyes; relatively larger, filling most of the side of the head and present as prominent black spots in spirit material.

Maxilla 1; relatively feeble, a single spine on the inner plate, four long hairs on the apex of the single-pointed palp; the eleven spine teeth on the outer plate are weak.

Maxilla 2; feeble, and with sparse hairs present on the apices of the plates only.

Maxilliped; the teeth on the outer plate are small, and the plate itself does not reach much above the second joint of the palp, of which the finger is slender and weak.

Gnathopod 1; much less setose than *P. pacifica*, and its greater slenderness is due to the more elongate and slender joint five.

Gnathopod 2; very little setose with joint five twice as long as joint six.

Peraeopod 5; the basis (fig. 6, 1) is more rounded than in *P. pacifica*, and is only lightly spined.

The last urosome segment bears no spines.

The side plates are of moderate size, the first, second, third, and fourth with the margins very finely serrate.

This species was present in countless numbers in the waters of Spencer Gulf. The specimens collected varied in size between 3 and 5 mm. In life they are nearly transparent with prominent black eye-spots. Associated with them are many *Nototropis homochir* Haswell with the smaller specimens of which they are easily confused in the collecting dish.

Loc. Spencer Gulf, South Australia (K. Sheard and F. Moorhouse, March, 1938).

The species is named in recognition of the indispensable assistance given by Mr. F. W. Moorhouse (Chief Inspector of Fisheries and Game), particularly in the securing of tow-net material.

PARADEXAMINE FRINSDORFI sp. nov.

Head; rostrum acute, inter-antennal angle convex. Antenna 1; peduncle shorter than that of antenna 2; first joint shorter than second, third very slender and short; antenna 2, peduncle slender, joints 4 and 5 long and slender. Flagella in each case moderately long.

Carination of body; commencing from second last peraeon segment, accessory dentation from the last peraeon segment.

Lower lip; inner lobes long and slender, outer lobes with no tooth on inner margins, mandibular processes only slightly upturned.

Mandible; cutting edge complexly dentate, accessory cutting edge dentate, two spines on spine row, molar fairly prominent, the space between the spine row and the molar is occupied by a ridge with rounded teeth.

Maxilla 1; inner lobe with no end bristles, outer plate with 10–11 toothed spines, single-jointed palp with six long hairs.

Maxilla 2; inner plate with strong setae, 3 to 5 on outer edge, 6 to 8 on apex, outer plate with the distal half fringed with scattered setae.

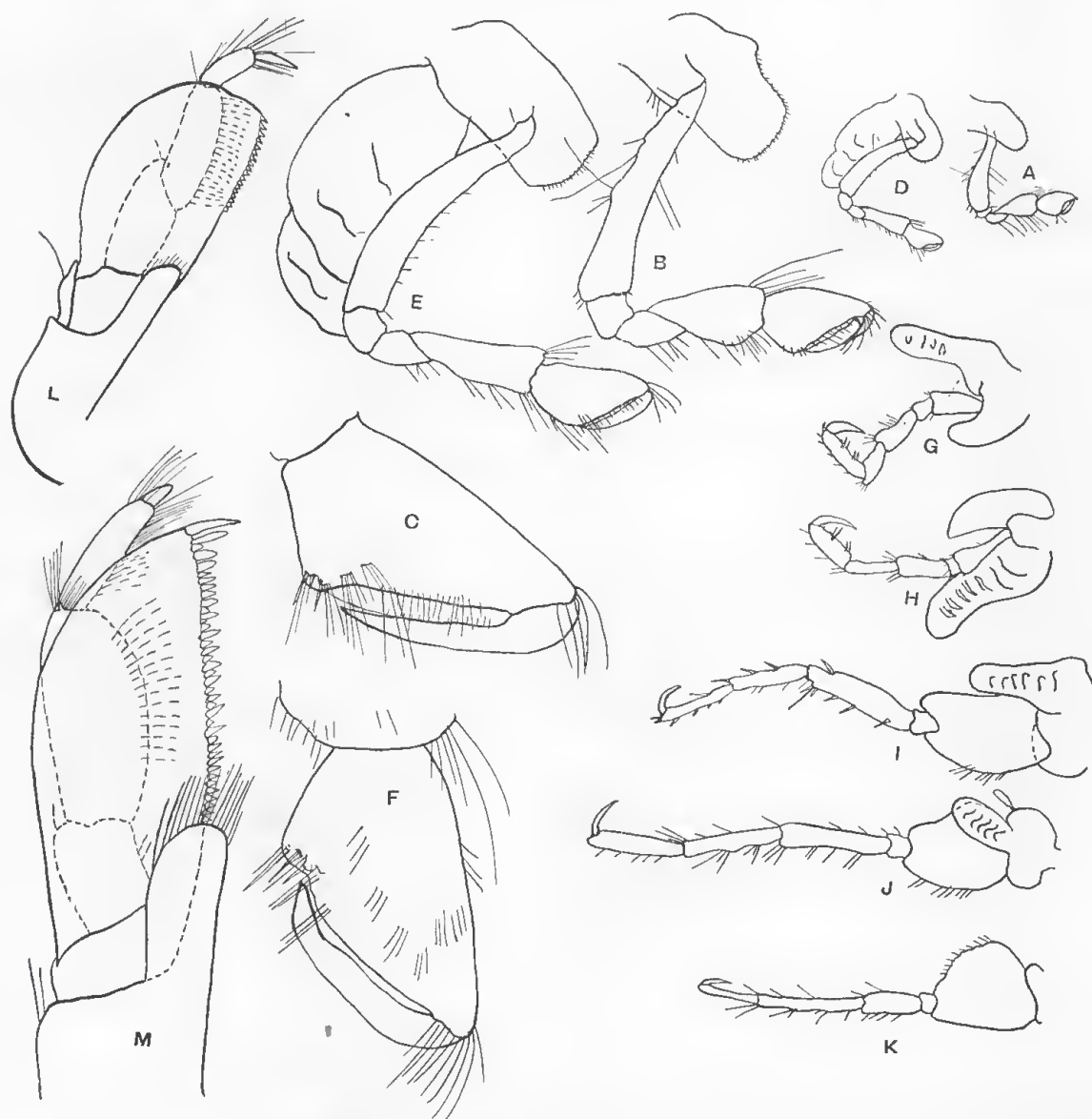


Fig. 8. A–L, *Paradoxamine frinsdorfi* (type ♂): A–C, first gnathopod; D–F, second gnathopod; G–K, pereopods; L, half maxilliped; M, *Paradoxamine pacifica* (lectotype ♂) half of maxilliped. (K.S. del.)

Maxilliped; inner plate small, outer plate not reaching much above second joint of palp, teeth small, finger of palp moderately strong.

Gnathopod 1; joint five slightly longer than six.

Gnathopod 2; joint five longer than joint six. Side plates of both, minutely dentate with short hairs growing between the teeth.

Peraeopods 1 to 5, comparable with *P. flindersi*.

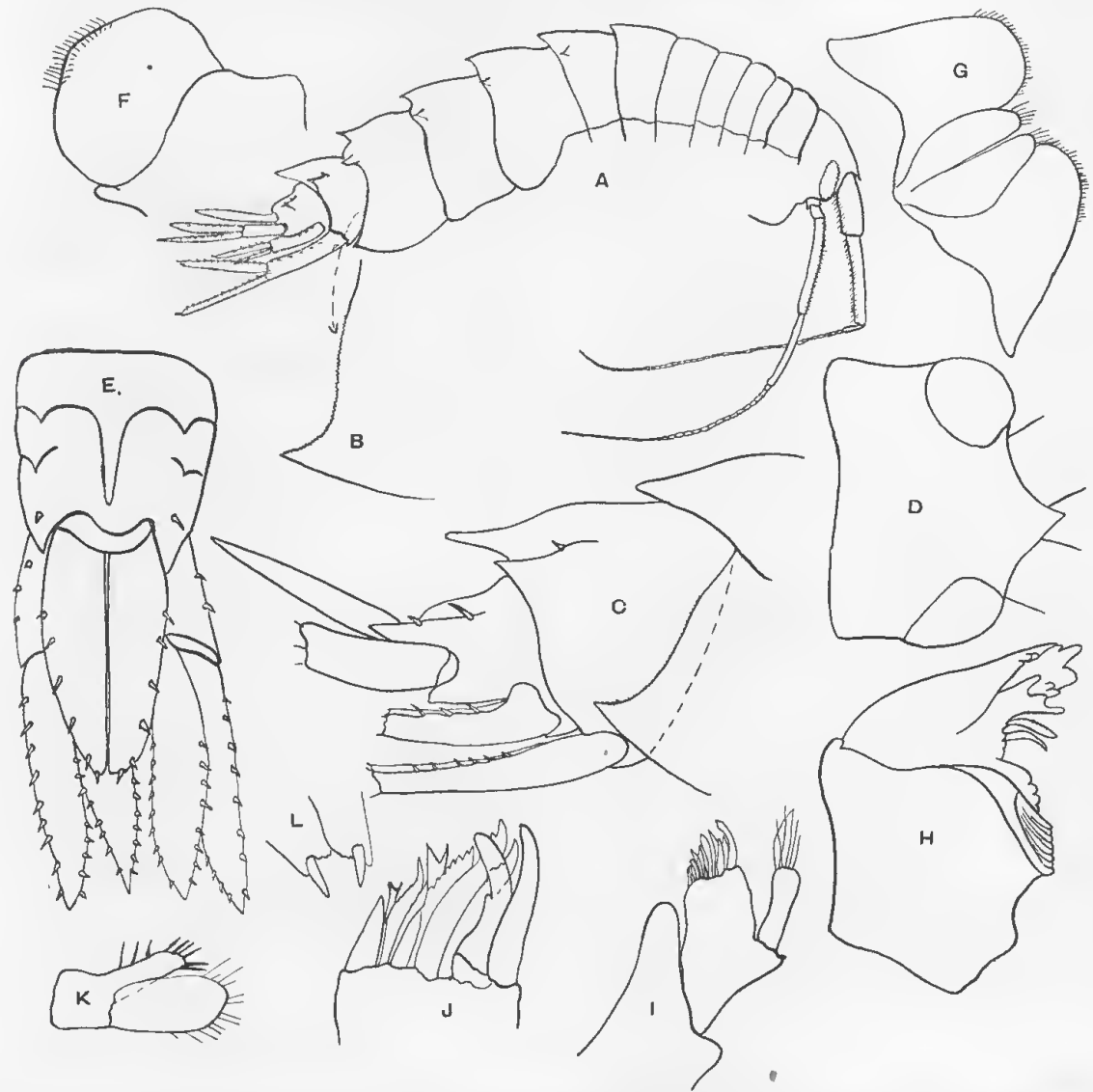


Fig. 9. *Paradoxamine frinsdorfi* (type ♂): A, outline of body; B, margin of pleon side plate three; C, urosome; D, plan of head; E, plan of urosome; F, upper lip; G, lower lip; H, mandible; I-J, first maxilla; K, second maxilla; L, apex of telson. (K.S. del.)

Pleopods; strong.

Uropods; comparable with *P. fissicauda*.

Telson; cleft to base, each lobe bearing six teeth on its outer margin, the apex of each lobe is produced to a small point at the outer side, then follows a strong spine, then several very small teeth with no intermediary setule.

Branchiae; pleated.

Eyes; large, oval and prominent (see fig. 7, d). Their colour varies from faded red to dark red in spirit.

Length; 6–8 mm.

Although not nearly as numerous as *P. moorhousei*, the species is quite common, and together with the first named, provided the bulk of the free Amphipodan fauna of the Gulf waters at the date of the collections.

In life, with its predominating colour of scarlet, eyes of reddish sapphire, and with prominent sapphire colour-spots on the side plates, it is at once recognizable in a collecting dish. In the darkness it is faintly phosphorescent.

Although the specimen described is probably an intersex (see rudimentary marsupial plate, fig. 7, J), it is characteristic of the species and neither (♂) nor (♀) appear to exhibit any marked variation from this form.

The species was named after Mr. A. Frinsdorf (Senior Inspector of Fisheries) to whose knowledge of the Gulf waters and conditions our useful collections were largely due.

Loc. Off St. Francis Island, Great Australian Bight (Dr. J. C. Verco, 1907); Spencer Gulf (K. Sheard and F. W. Moorhouse, March, 1938).

The literature and synonymy of the other species admitted in the Genus (of which *P. pacifica* is the genotype) are as follows:

PARADEXAMINE FISSICAUDA Chevreux.

Paradexamine fissicauda Chevreux, 1906, p. 88 (fig.) and 1913, p. 181; ? Chilton, 1912, p. 501 and ? 1925, p. 178; Schellenberg, 1931, p. 210; Barnard, 1932, p. 217; Stephensen, 1938, p. 240.

PARADEXAMINE FLINDERSI (Stebbing).

Dexamine flindersi Stebbing, 1888, p. 146.

Guernea flindersi Stebbing, 1906, p. 522.

Paradexamine flindersi Stebbing, 1910, p. 103, plate lii.

PARADEXAMINE NANA Stebbing.

Paradexamine nana Stebbing, 1914, p. 366; Schellenberg, 1931, p. 210.

PARADEXAMINE SEXDENTATA Schellenberg.

Paradexamine sexdentata Schellenberg, 1931, p. 211, fig. 106.

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